

SEQUENCE OF OPERATION

PACKAGED COOLING/HEATING UNITS:

SPACE SETPOINTS: EG LAB: 78° F / 50% RH SUMMER
70° F / 40% RH WINTER
UPS LAB: 72° F / 50% RH
REMAINDER: 75° F / 50% RH SUMMER; 73° F / 40% RH SUMMER

BASIC SUMMER CYCLE SEQUENCE: FAN SHALL OPERATE CONTINUOUSLY. WHEN A CALL FOR MECHANICAL COOLING IS REQUIRED AND ROOM HUMIDITY IS BELOW SETPOINT UNIT SHALL OPERATE IN NORMAL COOLING MODE. IF ROOM SETPOINT TEMPERATURE IS SATISFIED BUT HUMIDITY IS ABOVE SETPOINT THEN HOT GAS REHEAT MODE SHALL OPERATE TO SATISFY ROOM SETPOINT HUMIDITY. WHEN ROOM TEMPERATURE AND HUMIDITY ARE ABOVE SETPOINTS THEN SUBCOOLING MODE SHALL OPERATE.

BASIC WINTER CYCLE SEQUENCE: STAGING OF FURNACE SHALL FIRE IN SEQUENCE TO MAINTAIN DESIRED ROOM SETPOINT TEMPERATURE. DEHUMIDIFICATION MODES SHALL BE DE-ENERGIZED.

BASIC ECONOMIZER CYCLE: OUTSIDE AIR AND RETURN AIR DAMPERS ARE MODULATED TO MAINTAIN A 54 F DISCHARGE AIR TEMPERATURE. ECONOMIZER MODE SHALL BE ENGAGED WHEN RETURN AIR TEMPERATURE DROPS BELOW OUTSIDE AIR TEMPERATURE.

POWER EXHAUST: UNITS EQUIPPED WITH POWER FANS SHALL EXHAUST AIR WHEN OUTSIDE AIR DAMPERS ARE IN A POSITION GREATER THAN 50%.

UNOCCUPIED MODE: NIGHT SETBACK MODE IS TIME CLOCK CONTROLLED WITH TIMED OVERRIDE FROM HVAC CONTROL SYSTEM. WHEN UNIT IS SWITCHED BACK TO OCCUPIED MODE OUTSIDE AIR DAMPER WILL REMAIN CLOSED FOR A PERIOD OF ONE HOUR. FAN SHALL BE IN AUTOMATIC MODE.

RTU-2 SHALL BE ENERGIZED AND DE-ENERGIZED BY SWITCH IN THE EG LAB.

VAV TERMINALS:

COOLING MODE: WHEN THE UNIT IS OPERATING AT MINIMUM CFM, AN INCREASE IN ROOM TEMPERATURE CAUSES THE CFM TO BEGIN INCREASING AT 1° F BELOW THE THERMOSTAT SET POINT. THE CFM CONTINUES TO INCREASE UNTIL THE TEMPERATURE IS 1° F ABOVE THE SET POINT, OR AT MAXIMUM CFM.

HEATING MODE: WHEN THE UNIT IS OPERATING AT MAXIMUM CFM, AN INCREASE IN ROOM TEMPERATURE CAUSES THE CFM TO BEGIN DECREASING AT 1° F ABOVE THE THERMOSTAT SET POINT. THE CFM CONTINUES TO DECREASE UNTIL THE TEMPERATURE IS 1° F BELOW THE SET POINT OR AT MINIMUM CFM.

EXHAUST FANS:

A. EF-2 SHALL ENERGIZE DURING THE OCCUPIED MODE OF RTU-1 AND DE-ENERGIZE DURING UNOCCUPIED MODE.

B. EF-1 & EF-2 SHALL ENERGIZE UPON GAS DETECTION AND RTU-1 SHALL BE FORCED INTO ECONOMIZER CYCLE.

EG LAB:

A. RESPECTIVE MOTORIZED DAMPER SHALL OPEN WHEN ENGINE CONTACT CLOSURE IS MADE AND SHALL CLOSE WHEN CONTACT IS OPEN. REFER TO DETAIL D M-302 THIS SHEET.

B. UPS LAB SHALL REMAIN UNDER POSITIVE PRESSURE AT ALL TIMES USING STATIC PRESSURE SENSORS. WHEN DIFFERENTIAL PRESSURE INCREASES DUE TO EMERGENCY GENERATOR START-UP SF-1 SHALL ENERGIZE TO MAINTAIN DIFFERENTIAL SETPOINT PRESSURE WITH VSD. IF DIFFERENTIAL PRESSURE CONTINUES TO INCREASE SF-2 SHALL BE ENERGIZED TO MAINTAIN DIFFERENTIAL SETPOINT PRESSURE.

C. EXHAUST FAN EF-4 SHALL ENERGIZE AND SF-1 SHALL ENERGIZE TO 60% AIR FLOW RATE UPON GAS DETECTION ABOVE SETPOINTS AND SHALL DE-ENERGIZE WHEN GAS LEVELS ARE BELOW ALARM SETPOINT LEVELS. A HIGHER GAS DETECTION LEVEL BEYOND INITIAL ALARM SHALL SIGNAL ELECTRICAL SYSTEM TO SHUT OFF POWER (REFER TO ELECTRICAL SEQUENCE.)

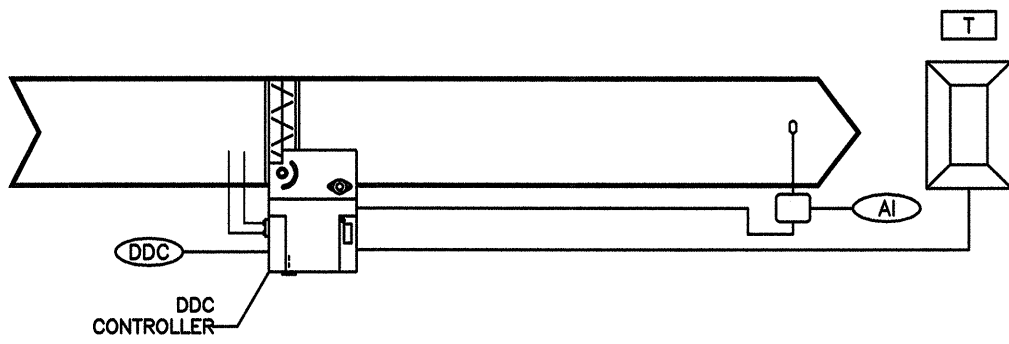
GENERAL NOTES:

1. DIAGRAMS SHOWN MAY NOT REFLECT EVERY POINT REQUIRED FOR PROPER CONTROL. PROVIDE ALL POINTS AND PROGRAMMING TO ACCOMPLISH THE SEQUENCE OF OPERATION AS DESCRIBED IN SPECIFICATIONS SECTION 15916.
2. HVAC CONTROL SYSTEM MUST COMPLY WITH DIVISION 16 REQUIREMENTS DUE TO CODE REQUIREMENTS OF THE UPS LAB OPERATION.

LEGEND OF ABBREVIATIONS & SYMBOLS

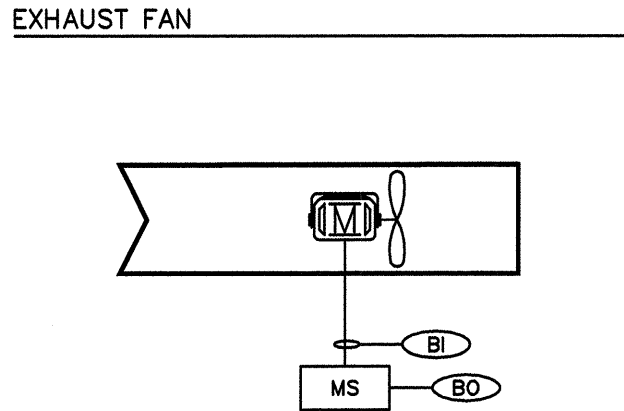
| ABBREVIATIONS | SYMBOLS |
|--|----------------------|
| AHU AIR HANDLING UNIT | LOW LIMIT THERMOSTAT |
| ASTAT AQUASTAT | DUCT TEMP. SENSOR |
| CHWR CHILLED WATER RETURN | MOTOR |
| CHWS CHILLED WATER SUPPLY | TRANSFORMER |
| CRU COMPUTER ROOM UNIT | RELAY |
| CR-x CURRENT RELAY | DIFF. PRESS. SWITCH |
| DA-x DAMPER ACTUATOR | FAN |
| DPT-x DIFFERENTIAL PRESSURE TRANSMITTER | SW-1 SWITCH |
| DP-x DIFFERENTIAL PRESSURE SWITCH | AVG. TEMP SENSOR |
| EF EXHAUST FAN | PIPE TEMP SENSOR |
| EP-x ELECTRIC TO PNEUMATIC TRANSDUCER | |
| F-x PNEUMATIC AIR FILTER | |
| HWR HOT WATER RETURN | |
| HWS HOT WATER SUPPLY | |
| HX HEAT EXCHANGER | |
| MANL-x DDC CONTROLLER | |
| MN-x VAV DDC CONTROLLER | |
| OAF-x OUTSIDE AIR FILTER | |
| PS-x POWER SUPPLY | |
| RC-x RELAY AND CURRENT RELAY COMBINATION | |
| REC POWER RECEPTACLE | |
| R-x RELAY | |
| SB-x PNEUMATIC SIGNAL BOOSTER | |
| SW-x SWITCH | |
| TDR TIME DELAY RELAY | |
| TE-x TEMPERATURE SENSOR | |
| THE-x TEMPERATURE AND HUMIDITY SENSOR | |
| T-x DIGITAL THERMOSTAT | |
| UNC UNIVERSAL NETWORK CONTROLLER | |
| VFD VARIABLE FREQUENCY DRIVE | |
| V-x VALVE | |
| XF-x TRANSFORMER | |

A RTU-1 & RTU-2
NO SCALE

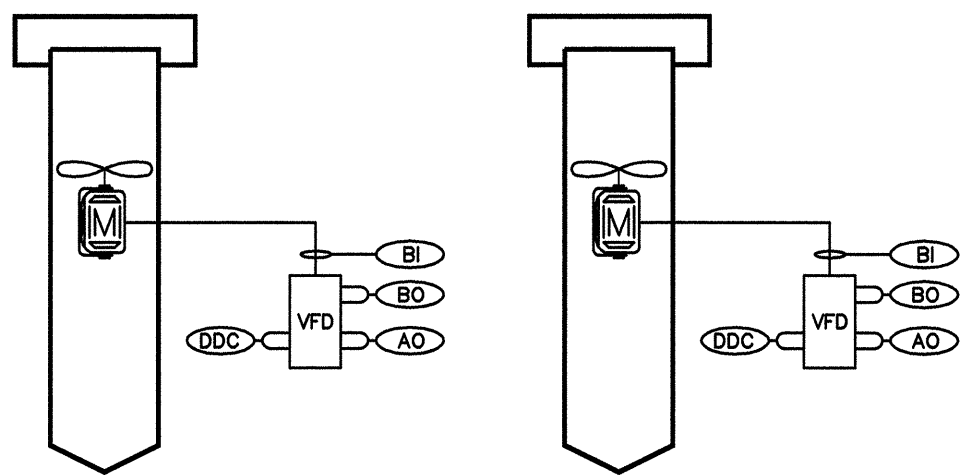


B VAV TERMINAL
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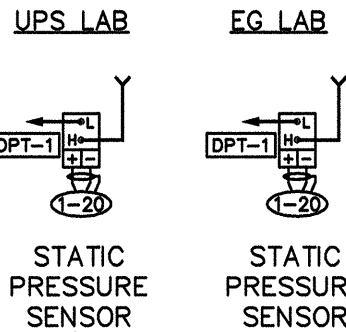
SUPPLY FANS SF-1 & SF-2



C EXHAUST FANS
NO SCALE



D SUPPLY FANS
NO SCALE



E EG LAB DAMPERS
NO SCALE
NOTE: PROVIDE JCI M9220-BGA-3, 24V ELECTRIC SPRING RETURN ACTUATOR FOR EACH DAMPER, FOUR (4) CT.